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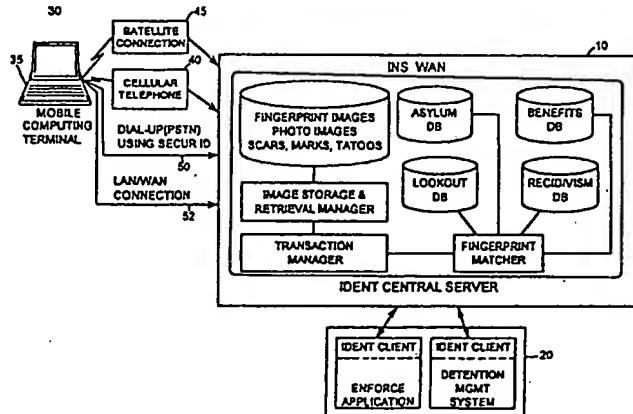
(57) Abstract

   A distributed biometric identification system incorporates highly mobile workstations. The system generally includes a plurality of mobile workstations and a file server remotely located from the workstations. The workstations receive input biometric data, such as fingerprint and photographic data, and couples that biometric data to the remote file server. The file server compares the input biometric data with stored biometric data to determine whether any of the stored biometric data matches the input biometric data. The results of the comparison are provided to the workstation that requested the comparison. Workstation mobility is enhanced by providing a wireless and/or PSTN communications link between the workstation and the remotely located file server. Workstation mobility is further improved by housing the workstation in a self-contained, compartmentalized carrying case. Workstation mobility may be even further enhanced by housing the workstation in a so-called lunchbox configuration having a main body, a front panel hinged to the main body, and a back panel hinged to the main body. The front and back panels each have a stowed position adjacent the main body, and a deployed position away from the main body. When the panels are in their stowed positions, the workstation (i.e., main body, front panel, and back panel) is a compact, portable unit.

1

MOBILE BIOMETRIC IDENTIFICATION SYSTEM

TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to identification systems. More particularly, it relates to a method and apparatus for identifying individuals based on
5   biometric information such as fingerprints and photographs.

BACKGROUND OF THE INVENTION

In the past, identification of individuals that are processed by the Immigration and Naturalization Service
10 (INS) or other governmental agencies, for example, has been a relatively slow process. Although many governmental agencies maintain large databases containing fingerprints, photographic information and other relevant data pertaining to individuals that use the services of the respective
15 agencies, no known system has been able to quickly search and retrieve information relating to identification and interaction with these individuals. For example, the INS interacts with and is required to identify millions of persons each year, including immigration law violators,
20 immigration benefit applicants, individuals requesting asylum, travelers, and visitors to the United States. Many encounters are processed under severe time constraints and with insufficient access to relevant information.

A co-pending, commonly owned patent application,
25 serial no. 08/857,112 filed on May 15, 1997 addresses this problem by providing a distributed biometric identification system and architecture for rapidly identifying individuals using fingerprint and photographic data. The disclosed

2

architecture includes a centralized INS server, a plurality
of distributed client workstations that are remotely
located from the centralized server, and a wide area
telecommunications network interconnecting the client
5   workstations to the server.   The centralized server
includes a transaction management subsystem, a database for
storing fingerprint minutiae of individuals that are of
interest to users of the system, a matching controller
subsystem coupled between the transaction management
10   subsystem and the database for matching fingerprints of
individuals to fingerprints stored in the database, and an
image storage and retrieval subsystem for storing and
retrieving electronic images of fingerprints and
photographic images of individuals.

15   The above-described system is highly effective in
allowing a large number of remotely located users to
access, search, compare and retrieve various types of
biometric identifying data/information.   The present
invention is directed to an improvement wherein user
20   location options, user mobility, and overall user access to
the distributed biometric system is even further enhanced.

SUMMARY OF THE INVENTION

The present invention may be embodied in a distributed biometric identification system having highly mobile user workstations. More particularly, the invention may be embodied in a distributed, mobile biometric identification system and architecture for rapidly identifying individuals using fingerprint and photographic data. The disclosed architecture includes a centralized server, and a plurality of distributed, mobile client workstations that are remotely located from the centralized server. The mobile workstation includes a substantially portable two-way communications link (e.g., a land-based or satellite-based mobile radiotelephone) that may be used to place the mobile workstation in communication with the centralized server. The centralized server includes a transaction management subsystem, a database for storing fingerprint minutiae of individuals that are of interest to users of the system, a matching controller subsystem coupled between the transaction management subsystem and the database for matching fingerprints of individuals to fingerprints stored in the database, and an image storage and retrieval subsystem for storing and retrieving electronic images of fingerprints and photographic images of individuals.

The above-described mobile workstation is preferably embodied in a substantially portable computing environment having, for example, a portable computer, a portable camera coupled to the computer, a portable fingerprint scanner coupled to the computer, and a substantially portable two-way communications link (e.g., modem) coupled to the computer. Preferably, the communications link includes a land-based or satellite-based mobile radiotelephone.

In one embodiment of the present invention, the portable computer includes a so-called "notebook" or "laptop" computer having for example 32MB of RAM, an AC power supply, and an AC power cable. Additionally, the

4

portable computer is outfitted with an MRT VideoPort PC
card and a Megahertz 33.6 modem/ethernet card. The MRT
VideoPort PC card serves as the interface between the
portable computer hardware and the fingerprint scanner and
5   the color camera. An MRT video cable is also provided to
connect the MRT VideoPort PC card to the fingerprint
scanner and the color camera. The Megahertz 33.6
modem/ethernet card provides the portable computer the
ability to network to the INS server from local and remote
10   sites. Specifically, networking from local sites can be
accomplished through the ethernet functionality of the
card. Remote networking can be accomplished through the
use of the 33.6 baud modem functionality of the card.
Additionally, the required network and telephone cables are
15   also used in the configuration. The portable computer may
be configured with Windows 95 operating system software,
for example. The portable computer may be further
configured with a user-friendly and intuitive graphical
user interface using, for example, Microsoft Visual C++
20   software, and a structured language (SQL) based, client
server, front end query tool. The SQL software is an off
the shelf product from Oracle®. The SQL software is the
foundation of the Oracle® level of communication within the
system. That is, when the system user enters a query the
25   Oracle® component that accepts the query needs to be able
to communicate the query over the network to another
Oracle® component. The SQL language performs the operation
of enabling the query communication between Oracle®
components. The portable computer's screen displays menu-
30   driven screens from which users may select specific
functions (such as search and enroll, search only, and
verify functions) that are to be performed by the system.
        In another embodiment of the present invention, the
laptop computer, camera, fingerprint scanner and modem are
35   electronically coupled together and conveniently housed in

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a carrying case. For example, a two-piece, hinged rugged construction carrying case may be outfitted with a foam template having cutouts for holding in place the various components, a power strip for accepting the power cord

5   connections of the various components and providing 12 volt AC power thereto, and a 12 volt DC invertor having a 12 volt extension cord for coupling the strip to an alternative power source, for example, a cigarette lighter of an automobile. The power strip preferably includes

10   surge suppressor circuitry to protect the various components from damage due to power surges.

In still another embodiment of the invention, the above-described portable computer may be housed in a portable, substantially rectangular, self-contained unit

15   known generally as a "lunchbox" CPU. The lunchbox, according to the present invention, includes a main body, a front panel and a back panel. The front and back panels are hinged to the main body such that each may be folded up to a stowed position against the main body, or folded down

20   to a deployed position against the main body. In general, the main body houses the main computing boards and a display screen, the front panel houses a keyboard, and the back panel houses the camera, the fingerprint scanner and the modem. When in their stowed positions, the front and

25   back panels and the main body combine to form the portable lunchbox. When the front panel is deployed, it exposes the keyboard and the display screen on the main body. When the back panel is deployed, it exposes the camera, fingerprint scanner and modem.

30   The following describes the procedures that can be followed when using the above-described system in connection with immigration services. When an individual is identified as an undocumented alien, he/she is taken to a mobile workstation. The workstation operator chooses the

35   "search and enroll" feature. The initiation of "search and

6

enroll" brings up a screen that prompts the operator to first place the individual's left index finger on the fingerprint scanner. The screen then prompts the operator to place the individual's right index finger on the fingerprint scanner. Quality analysis is performed on the scanned fingerprint data to make sure that the fingerprint image is of sufficient quality. The screen then turns on the camera and prompts the user to snap a photograph of the individual.

After the picture is taken, the operator is returned to the entry screen for entry of non-biometric data (referred to herein as "biodata"). The user then enters the alien's name, birth date, age and any other information that can be obtained. The workstation associates all entered "biodata" with the current biometric data and with the current request. Upon completion of the biodata screen, a submit button is pressed. The submit button initiates sending the data via modem to the file server located at a remote processing center. A key feature of the invention is that the data is transmitted to the processing center over a widely available communications link such as the public switched telephone network (PSTN), land-based radiotelephone infrastructure, or satellite-based communications.

The processing center takes over and starts processing the input data, freeing the workstation to being enrolling another individual. A status indicator on the bottom of the workstation screen indicates the status of a particular transaction. The data processing center searches a number of databases, each of which has its own meaning. The databases are referred to generally as "lookout," "recidivists," "asylum," and "benefits." The lookout database contains information on individuals with criminal records on file with the Immigration and Naturalization Services, or who are considered to be "lookouts" posing

7

potential threats to the health and safety of border patrol personnel. The recidivists database contains information on individuals who have attempted to enter the U.S. illegally on multiple occasions. The asylum database contains information on individuals encountered during an asylum application process. The asylum information is checked to detect and reduce immigration fraud. The benefit database is used to verify the identity of individuals encountered during the benefit servicing process to approve or deny applications or petitions for immigration benefits.

The data processing center reports to the workstation the number of hits, if any. The workstation may then call up the biometric data and/or the biodata for each hit in order to review it and make a determination of whether the "hit" is the individual in question.

The present invention may be embodied in a mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising: a portable computer; a biometric data input system coupled to said portable computer; a portable communications terminal coupled to said portable computer; said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a wireless communications link; said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; said computer programmed to control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

8

The present invention may also be embodied in a mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising: a portable computer; a biometric data input

5   system coupled to said portable computer; a portable communications terminal coupled to said portable computer; said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said

10   workstation, at least a portion of said communications link comprising a public switched telephone network (PSTN); said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; said computer programmed to

15   control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

20   In an alternative embodiment of the above-described combination, the portable communications terminal comprises a telephone dialing apparatus; and said initiating comprises dialing a telephone number to establish a telephone line connection with said remotely located file

25   server over said PSTN.

The present invention may be further embodied in a mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising: a portable computer; a fingerprint scanner

30   coupled to said portable computer; a camera coupled to said portable computer; a portable communications terminal coupled to said portable computer; said communications terminal capable of initiating the establishment of a communication link between said workstation and a file

35   server remotely located from said workstation, at least a

portion of said communications link comprising a wireless communications link; said fingerprint scanner capable of receiving input fingerprint information and providing said input fingerprint information to said computer; said camera capable of receiving input photographic information and providing said input photographic information to said computer; said computer programmed to control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server; said computer further programmed to receive from said file server over said communication link stored fingerprint and photographic information stored at said file server that matches said input fingerprint and photographic data transmitted from said workstation to said file server; said computer further programmed to receive from said file server over said communication link information indicating that no stored fingerprint or photographic information at said file server matches said input fingerprint or photographic data transmitted from said workstation to said file server.

The present invention may further be embodied in a mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising: a portable carrying case containing a portable computer, a biometric data input system coupled to said portable computer, a portable communications terminal coupled to said portable computer, and a power strip for coupling power to said computer, biometric data input system, and communications terminal; said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a wireless

communications link; said biometric data input system
capable of receiving input biometric information and
providing said input biometric information to said
computer; said computer programmed to control said portable
5   communications terminal to begin said initiation of said
communication link between said workstation and said file
server, and transmit said input biometric information over
said communication link to said remote file server.

The present invention may also be embodied in a method
10   of coupling biometric data to a file server for use in
connection with a distributed biometric identification
system, the steps comprising: gathering input biometric
data at a first location; initiating the establishment of
a communication link between said first location and a file
15   server remotely located from said first location, at least
a portion of said communications link comprising a wireless
communications link; and transmitting said input biometric
information over said communication link to said remote
file server.

20   In an alternative embodiment of the present invention,
the above described method further comprises the step of
receiving at said first location over said communication
link stored biometric information that matches said input
biometric data transmitted from said first location to said
25   file server.

In another alternative embodiment of the present
invention, the above described method further comprises the
step of receiving at said first location over said
communication link information indicating that no stored
30   biometric information at said file server matches said
input biometric data transmitted from said first location
to said file server.

In still another alternative embodiment of the present
invention, the above described method further comprises
35   said initiating step comprising dialing a telephone number

11

to establish a telephone line connection with said remotely located file server.

The present invention may also be embodied in a mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising: a portable computer having a main body, a front panel hinged to said main body, and a back panel hinged to said main body; said front panel having a stowed position adjacent said main body and a deployed position away from said main body; said back panel having a stowed position adjacent said main body and a deployed position away from said main body; a biometric data input system coupled to said portable computer and at least partially housed in said back panel; a portable communications terminal coupled to said portable computer and at least partially housed in said back panel; said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a wireless communications link; said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; said computer programmed to control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

The invention itself, together with further objects and attendant advantages, will best be understood by reference to the following detailed description, taken in conjunction with the accompanying drawings.

12

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a diagram of a distributed biometric identification system having mobile distributed workstations embodying the present invention.

5   FIGURE 2 is a hardware-based diagram of the mobile distributed workstation shown in FIGURE 1, wherein the portable computer of the mobile workstation includes a laptop or notebook computer.

FIGURE 3 is a more detailed diagram of the mobile

10   workstation shown in FIGURE 2, wherein the workstation incorporated a portable case.

FIGURE 4 is a hardware-based diagram of the mobile distributed workstation shown in FIGURE 1, wherein the mobile workstation is housed in a lunchbox configuration.

15   FIGURES 5 and 6 further illustrate the lunchbox configuration shown in FIGURE 4.

FIGURE 7 is a diagram illustrating the software operations that perform the biometric identification functions of the portable computers shown in FIGURES 1-6.

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13

DETAILED DESCRIPTION OF THE INVENTION

By way of introduction, a general description of the invention and the disclosed embodiments thereof will now be provided. The present invention may be embodied in a distributed biometric identification system having highly mobile user workstations. More particularly, the invention may be embodied in a distributed, mobile biometric identification system and architecture for rapidly identifying individuals using fingerprint and photographic data. The disclosed architecture includes a centralized server, and a plurality of distributed, mobile client workstations that are remotely located from the centralized server. The mobile workstation includes a substantially portable two-way communications link (e.g., a long-based or satellite-based mobile radiotelephone) that may be used to place the mobile workstation in communication with the centralized server. The centralized server includes a transaction management subsystem, a database for storing fingerprint minutiae of individuals that are of interest to users of the system, a matching controller subsystem coupled between the transaction management subsystem and the database for matching fingerprints of individuals to fingerprints stored in the database, and an image storage and retrieval subsystem for storing and retrieving electronic images of fingerprints and photographic images of individuals.

The above-described mobile workstation is preferably embodied in a substantially portable computing environment having, for example, a portable computer, a portable camera coupled to the computer, a portable fingerprint scanner coupled to the computer, and a substantially portable two-way communications link (e.g., modem) coupled to the computer. Preferably, the communications link includes a land-based or satellite-based mobile radiotelephone.

14

In one embodiment of the present invention, the portable computer includes a so-called "notebook" or "laptop" computer having for example 32MB of RAM , and AC power supply, and an AC power cable. Additionally, the
5   portable computer is outfitted with an MRT VideoPort PC card and a Megahertz 33.6 modem/ethernet card. The MRT VideoPort PC card serves as the interface between the portable computer hardware and the fingerprint scanner and the color camera. An MRT video cable is also provided to
10   connect the MRT VideoPort PC card to the fingerprint scanner and the color camera. The Megahertz 33.6 modem/ethernet card provides the portable computer the ability to network to the INS server from local and remote sites. Specifically, networking from local sites can be
15   accomplished through the ethernet functionality of the card. Remote networking can be accomplished through the use of the 33.6 baud modem functionality of the card. Additionally, the required network and telephone cables are also used in the configuration. The portable computer may
20   be configured with Windows 95 operating system software, for example. The portable computer may be further configured with a user-friendly and intuitive graphical user interface using, for example, Microsoft Visual C++ software, and a structured language (SQL) based, client-
25   server, front end query tool. The SQL software is an off the shelf product from Oracle®. The SQL software is the foundation of the Oracle® level of communication within the system. That is, when the system user enters a query the Oracle® component that accepts the query needs to be able
30   to communicate the query over the network to another Oracle® component. The SQL language performs the operation of enabling the query communication between Oracle® components. The portable computer's screen displays menu-driven screens from which users may select specific

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functions (such as search and enroll, search only, and verify functions) that are to be performed by the system.

In another embodiment of the present invention, the laptop computer, camera, fingerprint scanner and modem are electronically coupled together and conveniently housed in a carrying case. For example, a two-piece, hinged rugged construction carrying case may be outfitted with a foam template having cutouts for holding in place the various components, a power strip for accepting the power cord connections of the various components and providing 12 volt AC power thereto, and a 12 volt DC invertor having a 12 volt extension cord for coupling the strip to an alternative power source, for example, a cigarette lighter of an automobile. The power strip preferably includes surge suppressor circuitry to protect the various components from damage due to power surges.

In still another embodiment of the invention, the above-described portable computer may be housed in a portable, substantially rectangular, self contained unit known generally as a "lunchbox" CPU. The lunchbox, according to the present invention, includes a main body, a front panel and a back panel. The front and back panels are hinged to the main body such that each may be folded up to a stowed position against the main body, or folded down to a deployed position away from the main body. In general, the main body houses the main computing boards and a display screen, the front panel houses a keyboard, and the back panel houses the camera, the fingerprint scanner and the modem. When in their stowed positions, the front and back panels and the main body combine to form the portable lunchbox. When the front panel is deployed, it exposes the keyboard and the display screen on the main body. When the back panel is deployed, it exposes the camera, fingerprint scanner and modem.

The following describes the procedures that can be
followed when using the above-described system in
connection with immigration services. When an individual
is identified as an undocumented alien he/she is taken to
a mobile workstation. The workstation operator chooses the
"search and enroll" feature. The initiation of "search and
enroll" brings up a screen that prompts the operator to
first place the individual's left index finger on the
fingerprint scanner. The screen then prompts the operator
to place the individual's right index finger on the
fingerprint scanner. Quality analysis is performed on the
scanned fingerprint data to make sure that the fingerprint
image is of sufficient quality. The screen then turns on
the camera and prompts the user to snap a photograph of the
individual.

After the picture is taken, the operator is returned
to the entry screen for entry of non-biometric data
(referred to herein as"biodata"). The user then enters the
alien's name, birth date, age and any other information
that can be obtained. The workstation associates all
entered "biodata" with the current biometric data and with
the current request. Upon completion of the biodata
screen, a submit button is pressed. The submit button
initiates sending the data via modem to the file server
located at a remote processing center. A key feature of
the invention is that the data is transmitted to the
processing center over a widely available communications
link such as the public switched telephone network (PSTN),
land-based radiotelephone infrastructure, or satellite-
based communications.

The processing center takes over and starts processing
the input data, freeing the workstation to begin enrolling
another individual. A status indicator on the bottom of
the workstation screen indicates the status of a particular
transaction. The data processing center searches a number

17

of databases, each of which has its own meaning. The databases are referred to generally as "lookout," "recidivists," "asylum," and "benefits." The lookout database contains information on individuals with criminal records on file with the Immigration and Naturalization Services, or who are considered to be "lookouts" posing potential threats to the health and safety of border patrol personnel. The recidivists database contains information on individuals who have attempted to enter the U.S. illegally on multiple occasions. The asylum database contains information on individuals encountered during an asylum application process. The asylum information is checked to detect and reduce immigration fraud. The benefit database is used to verify the identity of individuals encountered during the benefit servicing process to approve or deny applications or petitions for immigration benefits.

The data processing center reports to the workstation the number of hits, if any. The workstation may then call up the biometric data and/or the biodata for each hit in order to review it and make a determination of whether the "hit" is the individual in question.

Referring now to FIGURE 1, a diagram of a system employing the present invention is shown. The system generally includes a central server 10, a set of software clients 20, and a mobile access station 30.

The central server 10 provides backend functionality for the system. The central server 10 provides a variety of functions including receiving input fingerprint images and photo images, image storage and retrieval management, transaction management, and fingerprint matching functionality, along with databases including "asylum," "lookout," "benefits," and "recidivism." These functions are available for use by the user at a mobile access station 30. Database functions may include but are not

18

limited to the storage and retrieval of biodata such as fingerprints, biographical history, and photographs. The database may also contain information as to whether an individual is dangerous, a repeat immigration offender, or

5   eligible for asylum and benefits.

The lookout database contains information on individuals with criminal records on file with the Immigration and Naturalization Services, or who are considered to be "lookouts" posing potential threats to the

10   health and safety of border patrol personnel. The recidivists database contains information on individuals who have attempted to enter the U.S. illegally on multiple occasions. The asylum database contains individuals encountered during an asylum application process. The

15   asylum information is checked to detect and reduce immigration fraud. The benefit database is used to verify the identity of individuals encountered during the benefit servicing process to approve or deny applications or petitions for immigration benefits.

20   The central server 10 also has access to software clients 20. These software clients 20 allow the system user to begin processing paperwork regarding an apprehended individual before returning to an office to complete processing of the individual. The software clients 20 are

25   accessed from mobile access stations 30 through the central server 10. Traditionally, paperwork on apprehended individuals has been typed on a typewriter and photocopied as necessary. The software clients 20 and the central server 10 allow the system user to enter relevant biodata

30   from the apprehended individual into a database. The biodata may then be accessed and printed as needed by all authorized users of the central server 10. Software clients 20 may include detention facility information, such as the location of a prisoner within the prison system; and

35   immigrant benefits and asylum information.

19

The mobile access station 30 shown in FIGURE 1 includes a mobile computing terminal 35, and remote access components such as a radiotelephone 40, a satellite connection 45, and a landline connection 50, as well as appropriate hardware for connecting to the above-noted remote access components and other input and output devices. Hardware for gaining remote access may include a modem or some other communication-type card that may be interfaced with the mobile computing terminal 35. Remote access components provide the system user a communication path between the mobile computing terminal 35 and the central server 10.

A more detailed illustration of the mobile access station 30 and its associated components are shown in FIGURE 2. As illustrated, the mobile access station 30 includes a mobile computing terminal 35, a radiotelephone 40, a satellite connection 45, a landline connection 50, a color camera 55, and a fingerprint scanner 60. The mobile computing terminal 35 may be embodied in a portable notebook/laptop computer operating on the Windows 95® environment. The mobile computing terminal 35 gains access to the central server 10 via one of four paths including: the radiotelephone 40, the satellite connection 45, the landline connection 50, or direct connection to the LAN/WAN 52. The use of radiotelephone 40 to establish communication preferably includes the use of a three-Watt cellular telephone known in the art as a "bag phone." The use of a bag radiotelephone provides a better data path to the remote access server 65 than a low power "hand-held" radiotelephone. When the mobile computing terminal 35 establishes communication to the central server 10, it does so through an access server 62. The access server 62 performs the function of verifying the identity of the entity who is attempting to gain access to the central server 10. In addition to the aforementioned communication

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devices, the mobile access station 30 includes a color
camera 55 and a fingerprint scanner 60. The color camera
55 and a fingerprint scanner 60 are used to gather
biometric data from the individual in question. The color
5   camera 55 may be a digital camera or any other device
suitable for obtaining digital images of apprehended
individuals. The fingerprint scanner 60 is provided for
obtaining digital images of the individual's fingerprints,
digital fingerprint scanners are well known in the art.
10 The color camera 55 and the fingerprint scanner 60 are
interfaced to the mobile computing terminal 35 via a video
capture card, which is known in the art.

In an alternative embodiment, a two-piece rugged
construction case 65 (see FIGURE 3) may be used to house
15 the mobile computing terminal 35, the radiotelephone 40,
the color camera 55, and the fingerprint scanner 60. The
portable case 65 provides component protection from shock
and water damage. Additionally, the portable case 65
eliminates the need for field personnel to connect the
20 various components of the mobile access station 30 together
each time the system is to be used. Rather the portable
case embodiment encases the connected hardware and creates
one self contained unit providing a power connection by
which to power the unit. The power connection may be a 120
25 VAC connection. Alternatively, a power connection may be
adapted to receive 12 VDC input from an automobile
cigarette lighter. The case may be outfitted with a foam
template having cutouts for holding in place the various
components, a power strip for accepting the power cord
30 connections of the various components and providing 12 volt
AC power thereto, and a 12 volt DC invertor having a 12
volt extension cord for coupling the strip to an
alternative power source, for example, a cigarette lighter
of an automobile. The power strip preferably includes

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surge   suppressor   circuitry   to   protect   the   various
components from damage due to power surges.

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FIGURE 4 illustrates another embodiment of the mobile
access station 30 of the present invention. This alternate
embodiment varies from the previous embodiment in that the
mobile   computing   terminal   is   housed   on   an   so-called
"lunchbox" configuration 70.   The lunchbox 70 is a self
contained   processing   unit   and   carrying   case.   The
processing unit and operating system of the lunchbox 70 are
identical to that of the mobile computing terminal 35.   The
lunchbox 70 is capable of a accepting a number of different
computer cards, which perform the function of interfacing
to   the   radiotelephone   40,   the   color   camera   55,   the
fingerprint scanner 60, the satellite connection 45, and
the landline connection 50. Additionally, the lunchbox 70
configuration   houses   the   radiotelephone   40,   the   color
camera 55, and the fingerprint scanner 60 in a manner
similar to the portable case 65.

The lunchbox 70 configuration offers the advantages of
being lightweight, small, low cost, self-contained, and
easy to maintain.   Another distinct advantage is the
addition of a bright screen that can be read in bright
daylight, as opposed to a conventional laptop LCD screen
that is difficult to read in bright sunshine. Similar to
the portable case 65 configuration, the only external
component to the lunchbox 70 is a power cord. Power may be
provided either using 120 VAC or 12 VDC.

Side and plan views of the lunchbox 70 configuration
can be seen in FIGURES 5 and 6.   The lunchbox 70
configuration includes a main housing 75, a keyboard 80, a
foldable front panel 85, a foldable back panel 90, a
display screen 95, and a processing unit (not shown) and
associated interface cards (not shown) for accessing the
radiotelephone 40, the color camera 55, and the fingerprint
scanner 60.

22

The front panel 85 folds down from an upright and locked position that covers the display screen 95 to a downward position which reveals the keyboard 80. Likewise, the back panel 90 folds down to permit user access to the radiotelephone 40, the color camera 55, and the fingerprint scanner 60. A major advantage to this particular feature is the fact that when both the front and back panels 85, 90 are closed and locked against the main housing 75 the keyboard 80, the display screen 95, and other associated components 40, 55, and 60 are protected from damage.

FIGURE 7 illustrates the software operations performed by the mobile workstation 30. As shown in FIGURE 7, the ident21m.exe file 100 is an executable file that is used on the mobile biometric identification system. The ident21m.exe file 100 is the file that controls the functions of the mobile terminal 30. The identi.ini file 110 holds initialization information that is used to initialize the ident21m.exe file 100, the mrtcap16.dll file 120, and imagemob.exe file 130. The ident.ini file 110 contains information pertaining to the hardware that is interfaced to the various software functions. For example, if a new fingerprint scanner is used, the ident.ini file 110 is the only file that must be changed to accommodate the hardware change.

The mrtcap16.dll file 120 performs the function of controlling video captures in the system. Specifically, the mrtcap16.dll file 120 controls the fingerprint scanner 60 and the color camera 55. After digital images are captured by the mrtcap16.dll file 120, they are passed to the imagemob.exe file 130, which performs the function of compressing and extracting digital images. The imagemob.exe file 130 makes software calls to a commercially available software package 140 known commercially under the tradename Cogent 140. The Cogent

23

software 140 performs the processing of the images received by the imagemod.exe file 130.

The ident21m.exe file 100 is interfaced to a transaction manger 150 which is located at a remote site.

5 The transaction manager 150 performs the function of receiving the image and biodata, as well as providing a software pathway from the ident21m.exe file 100 to the central server 10, which is also located at a remote site. Additionally, the ident21m.exe file 100 controls the on-

10 screen display. On-screen display software 160 (available from Accusoft) is used to create various gray-scale on-screen displays. The Accusoft 160 software also provides various display utilities that aid in processing on-screen graphics. The i213.jpg file 170 is a graphics file that is

15 printed when needed. Typically the i213.jpg file 170 is a form that is required when processing an apprehended individual.

When an individual is apprehended, the system user selects an icon from the on-screen display, which

20 preferably represents a Windows 95 environment. The icons represent the method of interface to the central server 10. After the network connection is established, the system user is prompted to enter verification. Upon completion of verification, the system user may elect to enroll the

25 apprehended individual into the database located at the central server 10. After selecting the enroll option, the ident.ini file 110 initializes all relevant files. As enrolment continues, the mrtcap16.dll file 120 performs the function of controlling the color camera and fingerprint

30 scanner in a manner to obtain necessary information from the individual. The video images are compressed by the software 140 under the control of the imagemob.exe file 130. The information is then transferred to the transaction manager 150 via the ident21m.exe file 100 over

35 the established communication link. The transaction

24

manager 150 forwards the information to the central server 10. Queries as to the history of the apprehended individual are also forwarded to the central server 10 in a similar fashion. Information regarding the history of the individual is returned to the ident21m.exe file 100 via the ident transaction manager 150. The received information is transferred to the screen display using the on-screen display software 160.

The mobile workstation 30 described herein is preferably embodied in a substantially portable computing environment having, for example, a portable (e.g., a laptop or notebook) computer, a substantially portable camera coupled to the computer, a substantially portable fingerprint scanner coupled to the computer, and a substantially portable communications link coupled to the computer and preferably taking the form or a modem embodied in a land-based or satellite-based mobile radiotelephone.

The portable computer described herein preferably includes, for example, 32 MB of RAM, an AC power supply, and an AC power cable. Additionally, the portable computer is outfitted with an MRT VideoPort PC card and a Megahertz 33.6 modem/ethernet card. The MRT VideoPort PC card serves as the interface between the portable computer hardware and the fingerprint scanner and the color camera. An MRT video cable is also provided to connect the MRT VideoPort PC card to the fingerprint scanner and the color camera. The Megahertz 33.6 modem/ethernet card provides the portable computer the ability to network to the INS server from local and remote sites. Specifically, networking from local sites can be accomplished through the ethernet functionality of the card. Remote networking can be accomplished through the use of the 33.6 baud modem functionality of the card. Additionally, the required network and telephone cables are also used in the configuration. The portable computer may be configured

with Windows 95 operating system software, for example.
The portable computer may be further configured with a
user-friendly and intuitive graphical user interface suing,
for example, Microsoft Visual C++ software, and a
structured language (SQL) based, client-server, front end
query tool. The SQL software is an off the shelf product
from Oracle®. The SQL software is the foundation of the
Oracle® level of communication within the system. That is,
when the system user enters a query the Oracle® component
that accepts the query needs to be able to communication
the query over the network to another Oracle® component.
The SQL language performs the operation of enabling the
query communication between Oracle® components. The
portable computer's screen displays menu-driven screens
from which users may select specific functions (such as
search and enrol, search only, and verify functions) that
are to be performed by the system.

Of course, it should be understood that a range of
changes and modifications can be made to the preferred
embodiment described above. For example, the present
invention is described in connection with a particular
hardware and processing structure for transmitting and
receiving live biometric data. However, a wide variety of
transmitting and receiving structures could be utilized as
long as the essential mobile distributed workstation
features described herein are present. It is therefore
intended that the foregoing detailed description be
regarded as illustrative rather than limiting and that it
be understood that it is the following claims, including
all equivalents, which are intended to define the scope of
this invention.

26

WHAT IS CLAIMED IS:

1.   A mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising:

    a portable computer;

    a biometric data input system coupled to said portable computer;

    a portable communications terminal coupled to said portable computer;

    said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a wireless communications link;

    said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; and

    said computer programmed to control said portable communications terminal to being said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

2.   The workstation of Claim 1 wherein said computer receives from said file server over said communication link stored biometric information stored at said file server that matches said input biometric data transmitted from said workstation to said file server.

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    3.   The workstation of Claim 1 wherein said computer receives from said file server over said communication link information indicating that no stored biometric information at said file server matches said input biometric data transmitted from said workstation to said file server.

    4.   The workstation of Claim 1 wherein:
said input biometric data comprises input fingerprint data;
said stored biometric data comprises stored fingerprint data; and
said computer receives from said file server over said communication link stored fingerprint information that matches said input fingerprint data transmitted to said file server from said workstation.

    5.   The workstation of Claim 1 wherein:
said input biometric data comprises input photographic data;
said stored biometric data comprises stored photographic data; and
said computer receives from said file server over said communication link stored photographic information that matches said input photographic data transmitted to said file server from said workstation.

    6.   The workstation of Claim 1 wherein said portable computer comprises a laptop computer.

    7.   The workstation of Claim 1 wherein said biometric data input system comprises a fingerprint scanner.

    8.   The workstation of Claim 1 wherein said biometric data input system comprises a camera.

28

9.   The workstation of Claim 6 wherein said biometric data input system comprises a fingerprint scanner and a camera.

5   10.   The workstation of Claim 1 wherein said portable communications terminal comprises a radiotelephone.

11.   The workstation of Claim 10 wherein said radiotelephone comprises a cellular telephone.

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12.   The workstation of Claim 10 wherein said initiating comprising dialing a telephone number to establish a telephone line connection with said remotely located file server.

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13. The workstation of Claim 1 wherein said portable communications terminal comprises a radiotelephone.

14.   The workstation of Claim 1 wherein said portable
20   communications terminal comprises a portable satellite terminal.

15.   The workstation of Claim 14 wherein said portable satellite terminal comprises a satellite dish antenna.

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16. A mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising:

a portable computer;

a biometric data input system coupled to said portable computer;

a portable communications terminal coupled to said portable computer;

said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a public switched telephone network (PSTN);

said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; and

said computer programmed to control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

17. The workstation of Claim 16 wherein:

said portable communications terminal comprises a telephone dialing apparatus; and

said initiating comprises dialing a telephone number to establish a telephone line connection with said remotely located file server over said PSTN.

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18.   The workstation of Claim 17 wherein:

said   telephone   dialing   apparatus   comprises   a
radiotelephone; and

at least a portion of said communications link further
comprises a wireless communications link.

    19.   A mobile workstation for use in connection with
a   distributed   biometric.   identification   system,   said
workstation comprising:

    a portable computer;

5   a   fingerprint   scanner   coupled   to   said   portable
computer;

    a camera coupled to said portable computer;

    a   portable- communications   terminal   coupled   to .said
portable computer;

10   said communications terminal capable of initiating the
establishment   of   a   communication   link   between   said
workstation and a file server remotely located from said
workstation, at least a portion of said communications link
comprising a wireless communications link;

15   said fingerprint scanner capable of receiving input
fingerprint   information   and   providing   said   input
fingerprint information to said computer;

    said camera capable of receiving input photographic
information   and   providing   said   input   photographic
20 information to said computer;

    said computer programmed to control said portable
communications terminal to begin said initiation of said
communication link between said workstation and said file
server, and transmit said input biometric information over
25 said communication link to said remote file server;

    said computer further programmed to receive from said
file server over said communication link stored fingerprint
and photographic information stored at said file server
that matches said input fingerprint and photographic data
30 transmitted from said workstation to said file server; and

    said computer further programmed to receive from said
file server over said communication link information
indicating that no stored fingerprint or photographic
information   at   said   file   server   matches   said   input

32

fingerprint or photographic data transmitted from said
workstation to said file server.

20.   The workstation of Claim 19 wherein:
said portable computer comprises a laptop computer;
said portable communications terminal comprises a
telephone dialing apparatus; and
said initiating comprises dialing a telephone number
to establish a telephone line connection with said remotely
located file server.

21.   A mobile workstation for use in connection with
a distributed biometric identification system, said
workstation comprising:
a portable carrying case containing a portable
computer, a biometric data input system coupled to said
portable computer, a portable communications terminal
coupled to said portable computer, and a power strip for
coupling power to said computer, biometric data input
system, and communications terminal;
said communications terminal capable of initiating the
establishment of a communication link between said
workstation and a file server remotely located from said
workstation, at least a portion of said communications link
comprising a wireless communications link;
said biometric data input system capable of receiving
input biometric information and providing said input
biometric information to said computer; and
said computer programmed to control said portable
communications terminal to being said initiation of said
communication link between said workstation and said file
server, and transmit said input biometric information over
said communication link to said remote file server.

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22. The workstation of Claim 21 wherein said carrying case further comprises internal compartments for securing each of said computer, biometric data input system, and said communications terminal.

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23. The workstation of Claim 22 wherein said internal compartments comprise cushion material.

24. A method of coupling biometric data to a file
10 server for use in connection with a distributed biometric identification system, the steps comprising:

gathering input biometric data at a first location;

initiating the establishment of a communication link between said first location and a file server remotely
15 located from said first location, at least a portion of said communications link comprising a wireless communications link; and

transmitting said input biometric information over said communication link to said remote file server.
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25. The method of Claim 24 further comprises the step of:

receiving at said first location over said communication link stored biometric information that
25 matches said input biometric data transmitted from said first location to said file server.

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26. The method of Claim 24 further comprising the step of:

receiving at said first location over said communication link information indicating that no stored biometric information at said file server matches said input biometric data transmitted from said first location to said file server.

27. The method of Claim 24 wherein:

said input biometric data comprises input fingerprint data;

said stored biometric data comprises stored fingerprint data; and

said first location receives from said file over said communication link stored fingerprint information that matches said input fingerprint data transmitted to said file server from said first location.

28. The method of Claim 24 wherein:

said input biometric data comprises input photographic data;

said stored biometric data comprises stored photographic data; and

said first location receives from said file server over said communication link stored photographic information that matches said input photographic data transmitted to said file server from said first location.

29. The method of Claim 24 wherein said initiating comprising dialing a telephone number to establish a telephone line connection with said remotely located file server.

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30. A mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising:

a portable computer having a main body, a front panel hinged to said main body, and a back panel hinged to said main body;

said front panel having a stowed position adjacent said main body and a deployed position away from said main body;

said back panel having a stowed position adjacent said main body and a deployed position away from said main body;

a biometric data input system coupled to said portable computer and at least partially housed in said back panel;

a portable communications terminal coupled to said portable computer and at least partially housed in said back panel;

said communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a wireless communications link;

said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; and

said computer programmed to control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

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31. The workstation of Claim 30 wherein said computer receives from said file server over said communication link stored biometric information stored at said file server that matches said input biometric data transmitted from
5   said workstation to said file server.

32. The workstation of Claim 30 wherein said computer receives from said file server over said communication link information indicating that no stored biometric information
10   at said file server matches said input biometric data transmitted from said workstation to said file server.

33. The workstation of Claim 30 wherein:
said input biometric data comprises input fingerprint
15   data;
said stored biometric data comprises stored fingerprint data; and
said computer receives from said file server over said communication link stored fingerprint information that
20   matches said input fingerprint data transmitted to said file server from said workstation.

34. The workstation of Claim 30 wherein:
said input biometric data comprises input photographic
25   data;
said stored biometric data comprises stored photographic data; and
said computer receives from said file server over said communication link stored photographic information that
30   matches said input photographic data transmitted to said file server from said workstation.

35. The workstation of Claim 30 wherein said biometric data input system comprises a fingerprint
35   scanner.

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36. The workstation of Claim 30 wherein said biometric data input system comprises a camera.

37. The workstation of Claim 30 wherein said portable communications terminal comprises a radiotelephone.

38. The workstation of Claim 37 wherein said radiotelephone comprises a cellular telephone.

39. The workstation of Claim 37 wherein said initiating comprising dialing a telephone number to establish a telephone line connection with said remotely located file server.

40. The workstation of Claim 30 wherein:
said main body houses a display;
said front panel houses a keyboard; and
said display and said keyboard are exposed when said front panel is in said deployed position, and said display and said keyboard are covered when said front panel is in said stowed position.

41. A mobile workstation for use in connection with a distributed biometric identification system, said workstation comprising:

a portable computer having a main body, a front panel hinged to said main body, and a back panel hinged to said main body;

said front panel having a stowed position adjacent said main body and a deployed position away from said main body;

said back panel having a stowed position adjacent said main body and a deployed position away from said main body;

a biometric data input system coupled to said portable computer and at least partially housed in said back panel;

a satellite communications terminal coupled to said portable computer;

said satellite communications terminal capable of initiating the establishment of a communication link between said workstation and a file server remotely located from said workstation, at least a portion of said communications link comprising a wireless communications link established via a satellite;
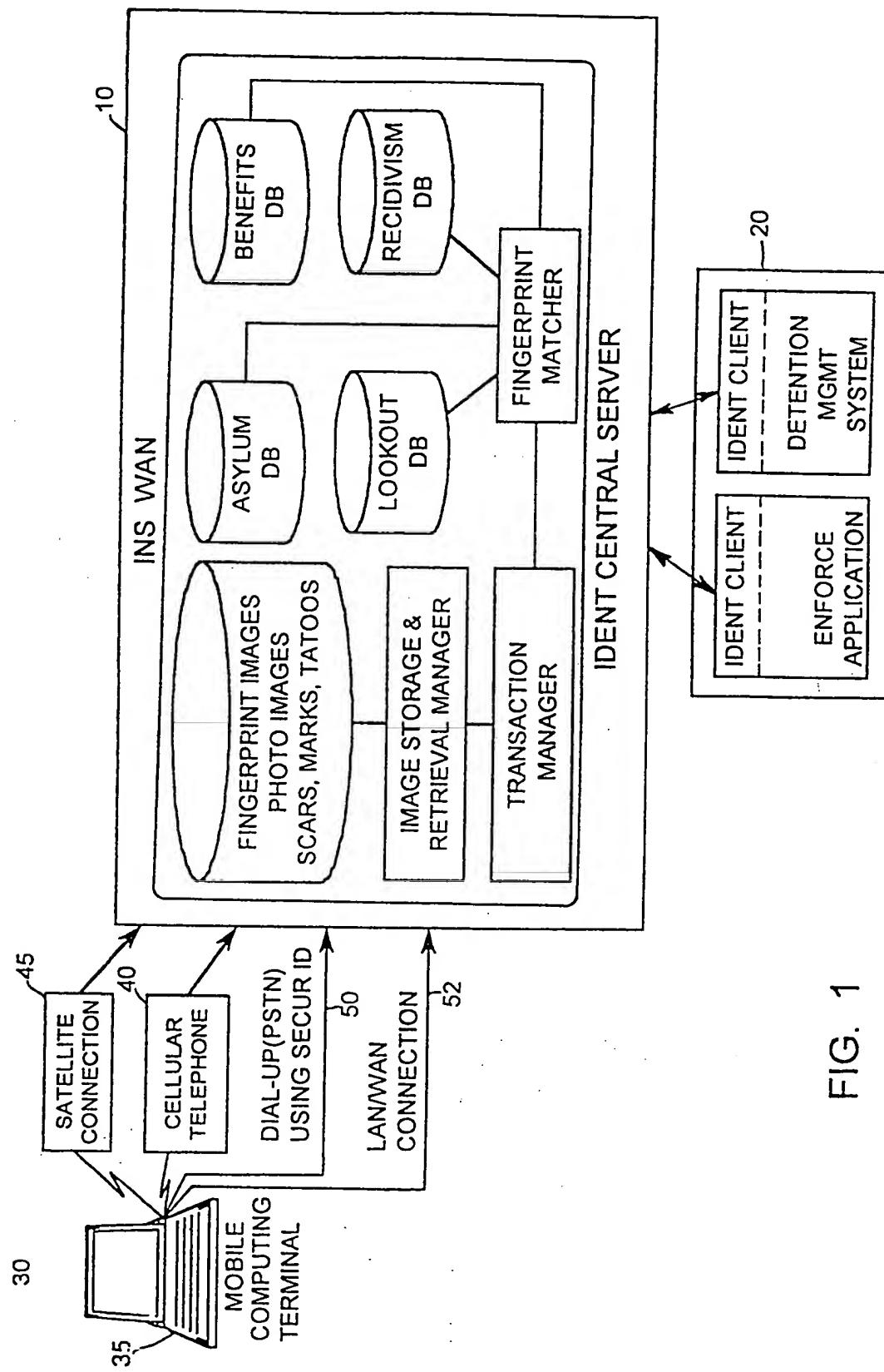
said biometric data input system capable of receiving input biometric information and providing said input biometric information to said computer; and

said computer programmed to control said portable communications terminal to begin said initiation of said communication link between said workstation and said file server, and transmit said input biometric information over said communication link to said remote file server.

42. The workstation of Claim 41 wherein said satellite communications terminal comprises a satellite dish antenna.

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43. A mobile workstation for use in connection with
a distributed biometric identification system, said
workstation comprising:

a portable computer having a main body, a front panel

5   hinged to said main body, and a back panel hinged to said
main body;

said front panel having a stowed position adjacent
said main body and a deployed position away from said main
body;

10   said back panel having a stowed position adjacent said
main body and a deployed position away from said main body;

a biometric data input system coupled to said portable
computer and at least partially housed in said back panel;

a portable communications terminal coupled to said

15   portable computer and at least partially housed in said
back panel;

said communications terminal capable of initiating the
establishment of a communication link between said
workstation and a file server remotely located from said

20   workstation, at least a portion of said communications link
comprising a public switched telephone network (PSTN);

said biometric data input system capable of receiving
input biometric information and providing said input
biometric information to said computer; and

25   said computer programmed to control said portable
communications terminal to begin said initiation of said
communication link between said workstation and said file
server, and transmit said input biometric information over
said communication link to said remote file server.

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44.   The workstation of Claim 43 wherein:

said portable communications terminal comprise said telephone dialing apparatus; and

said initiating comprises dialing a telephone number
5   to establish a telephone line connection with said remotely located file server over said PSTN.

45.   The workstation of Claim 44 wherein:

said   telephone   dialing   apparatus   comprises   a
10   radiotelephone; and

at least a portion of said communications link further comprises a wireless communications link.

FIG. 1

FIG. 2

COLOR
CAMERA 55

CELLULAR
TELEPHONE 40

FINGERPRINT
SCANNER 60

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NOTEBOOK COMPUTER

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65

PELICAN 1550
RUGGED CASE

FIG. 3

FIG. 4

FIG. 5

FIG. 6

FIG. 7
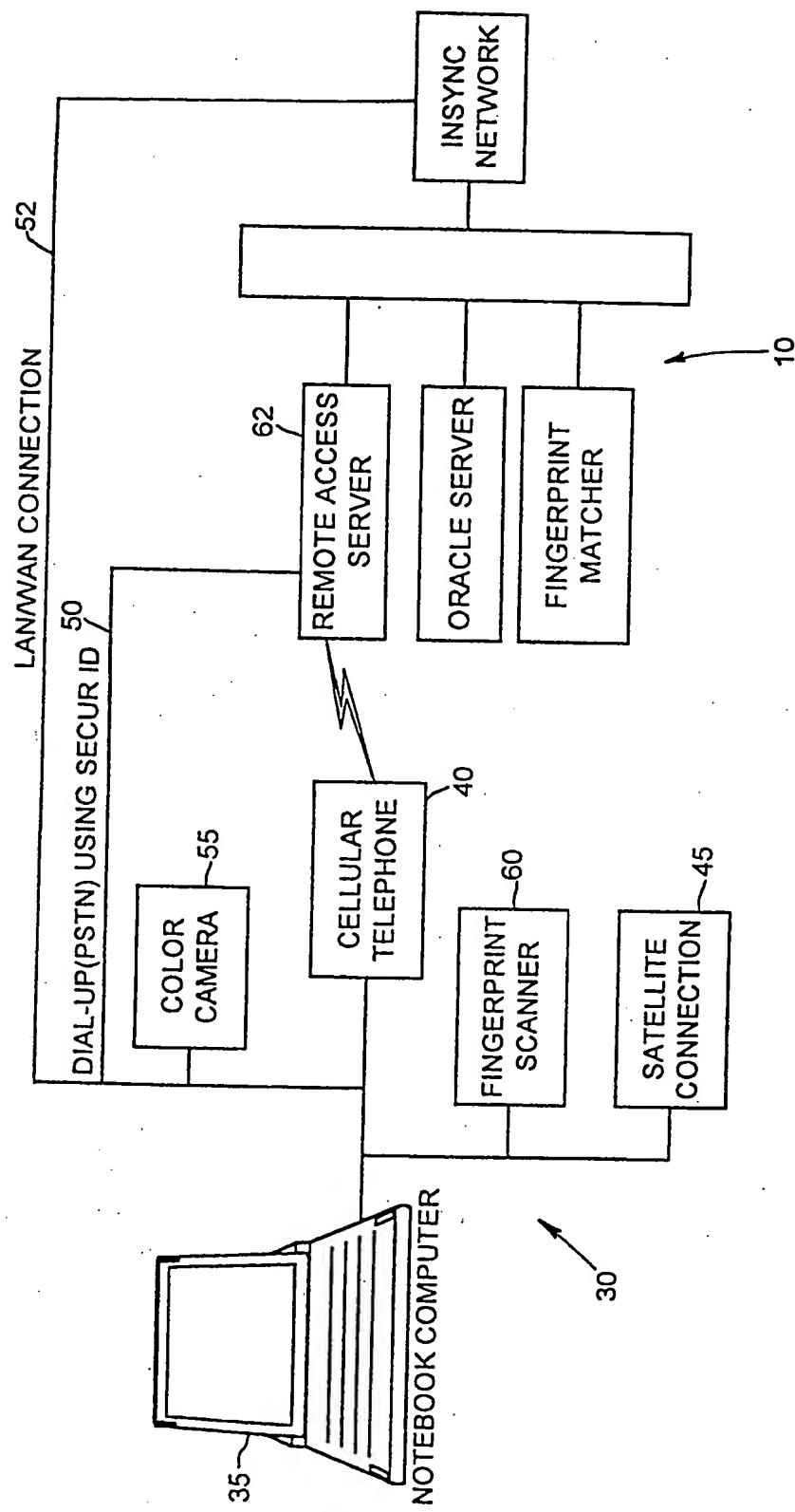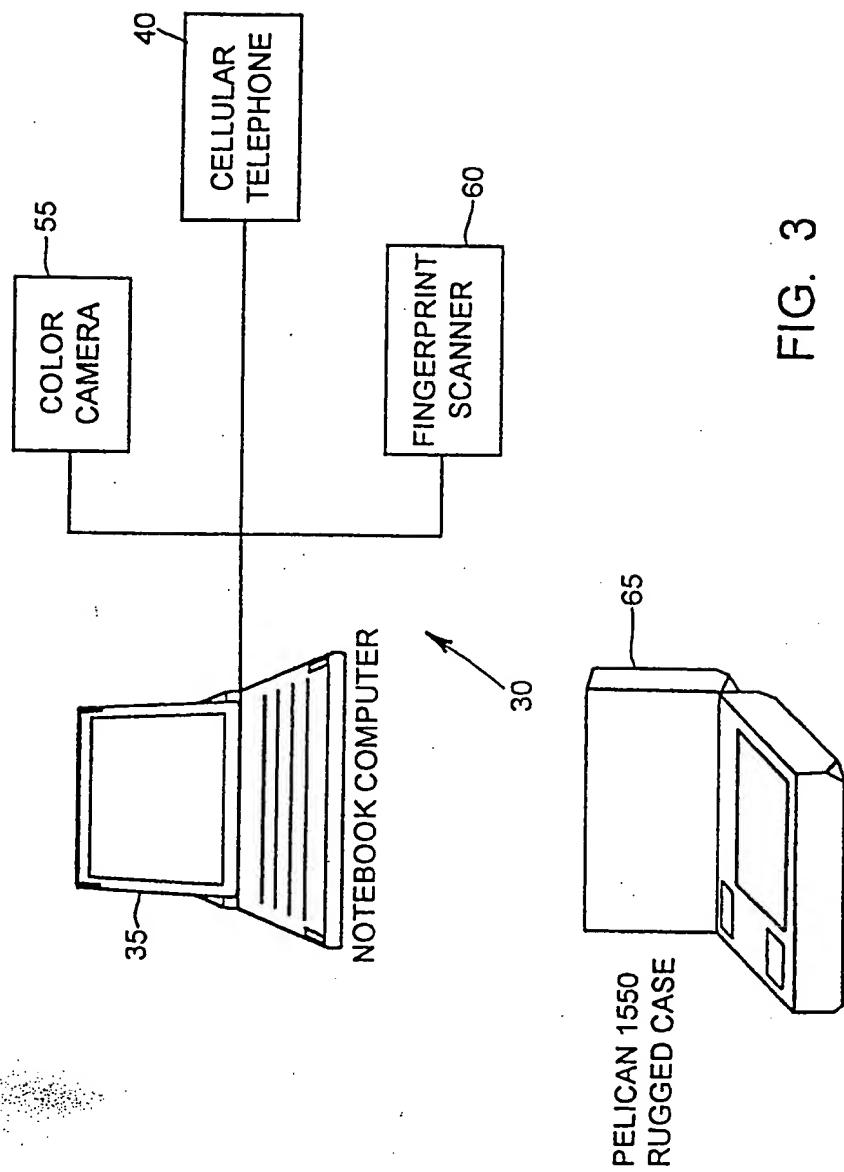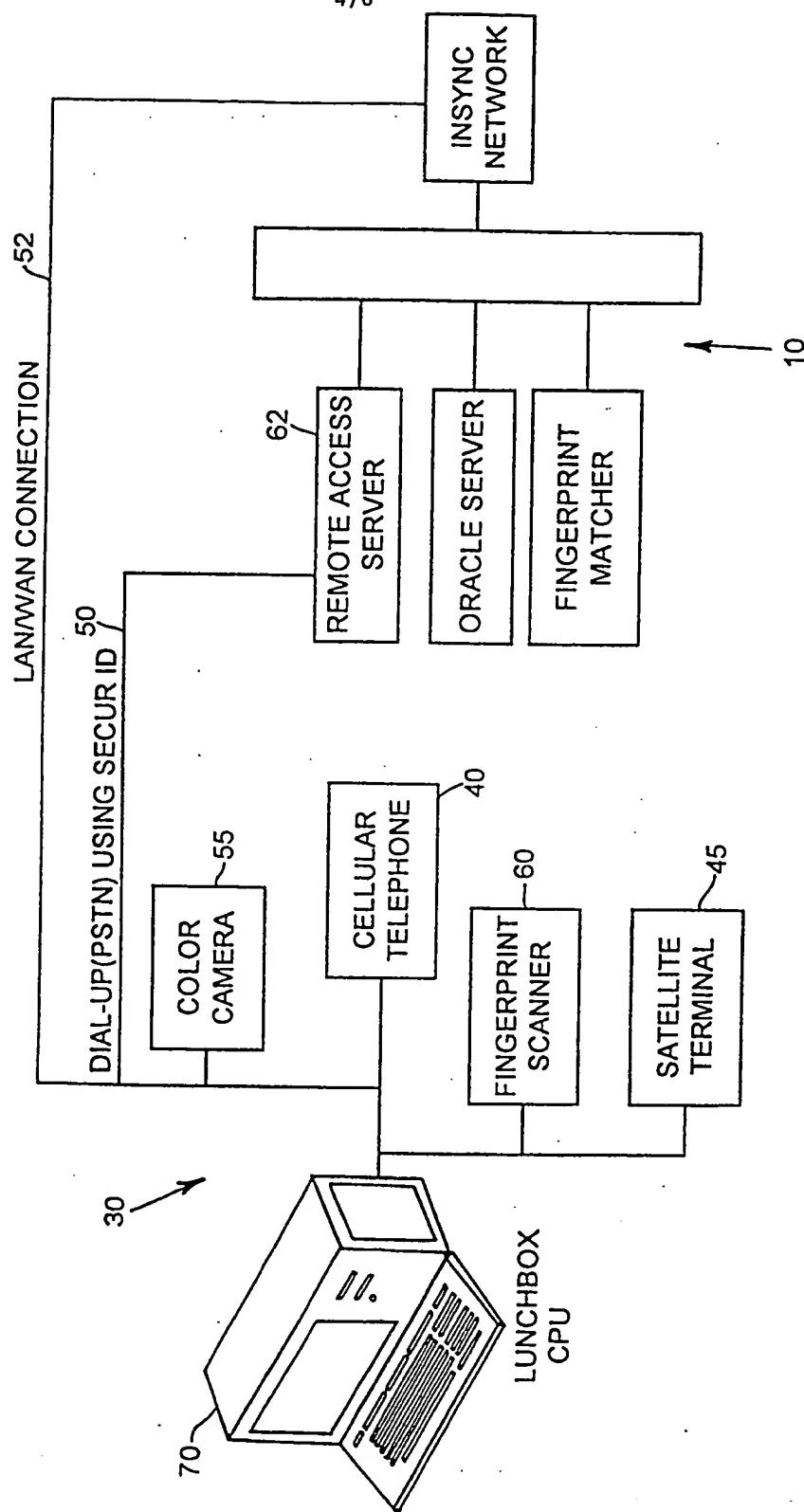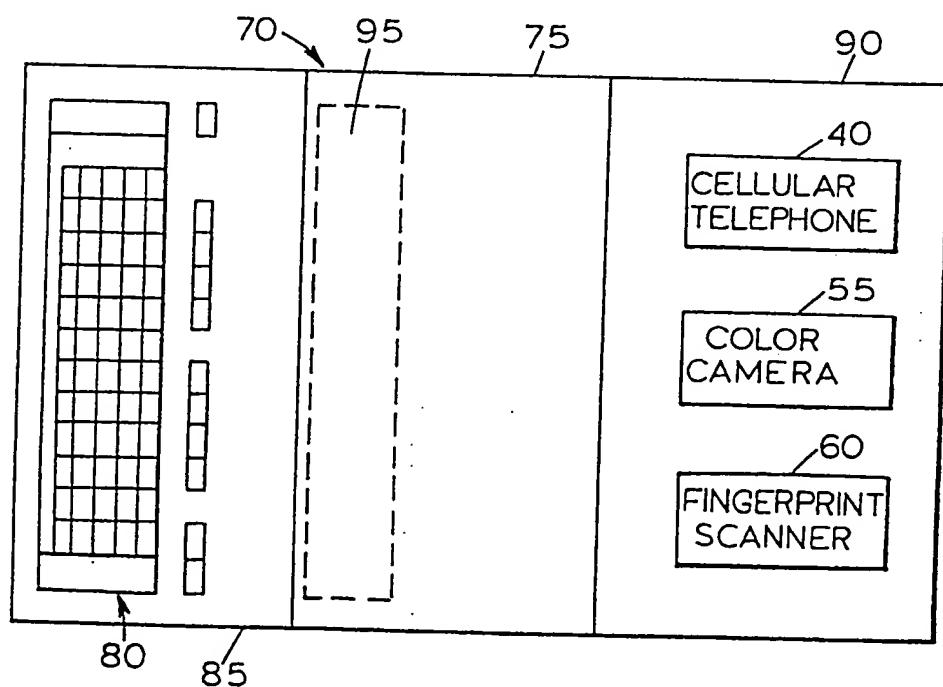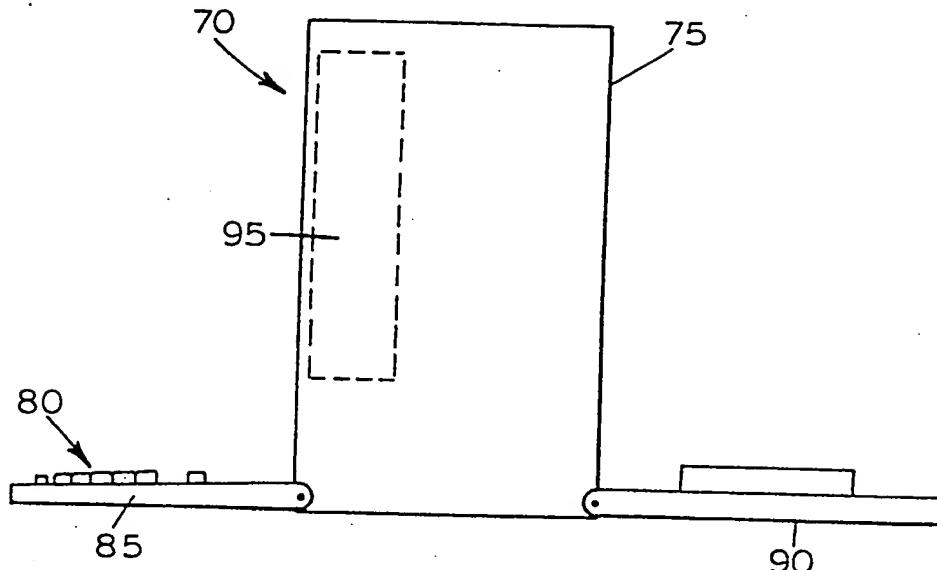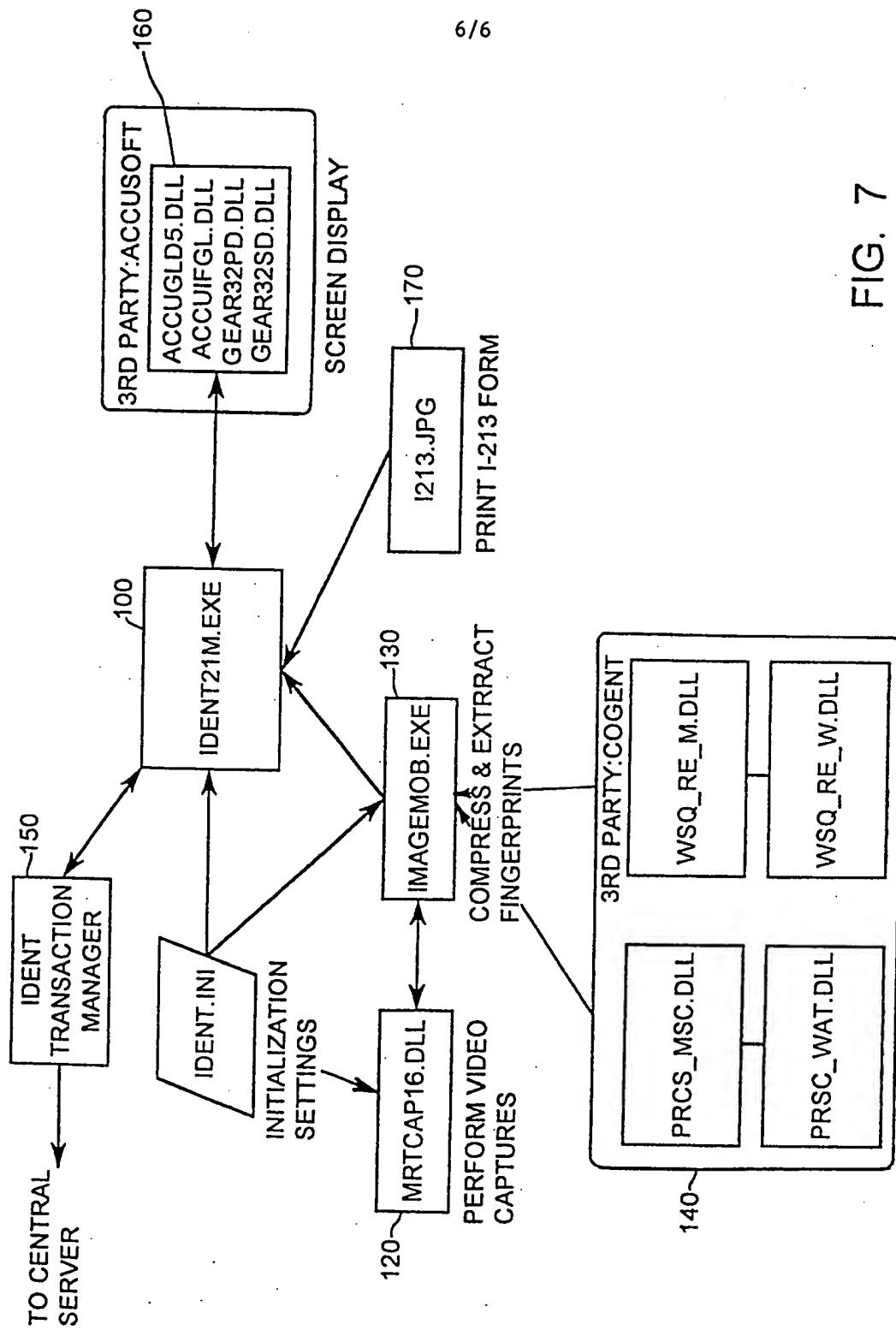
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6   G07C9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6   G07C   H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 94 22371 A (DIGITAL BIOMETRICS INC) 13 October 1994	1-5, 7-10,12, 13,16, 19,21, 24,27, 28,30, 33-37, 40-45
	see abstract; claims; figures see page 3, line 19 - page 4, line 7 see page 5, line 5 - page 6, line 3 see page 8, line 18 - line 33 ---- -/--	

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search

18 February 1999

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26/02/1999

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1

Inti   ional Application No

PCT/US 98/20089

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
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